SCOPE OF WORK — EV 2

Project Title: Evaluation of Traffic Signal Coordination between ADOT, City of Phoenix and City of Chandler

Project Goal: Evaluate the Impact and Assess Benefits due to Traffic Signal Timing Improvements, implemented through an earlier project carried out as part of the MAG Traffic Signal Optimization Program (TSOP).

Tasks:
Task 1: Data Collection

Task 1A: Travel Time Data Collection
The CONSULTANT will perform travel time studies of the above-named corridors. Travel time will be collected using the floating-car technique. Travel time will be collected prior to implementation of the new signal timing plan (Before Study). A second travel time data collection effort will occur approximately one month after the signal timing plan has been implemented (After Study).

To collect travel times and travel speeds required for this evaluation study, the CONSULTANT will use a Global Positioning System (GPS) equipment mounted in a floating vehicle. The GPS equipment will simplify the task of data collection, providing a larger amount of data and ensuring increased accuracy. The floating vehicle will travel the named corridors at the AM Peak, PM Peak, and Mid-Day Peak periods. The AM Peak period is defined as between 6:30 a.m. and 8:30 a.m., and the PM Peak Period is defined as 4:00 p.m. – 6:00 p.m. The Mid-Day-Peak Period is defined as 12:00 p.m. – 2:00 p.m. A minimum of 5 runs in each direction (eastbound and westbound) during each data collection period will be performed. Travel time data will be collected for a total of 240 miles for the before and after studies, as illustrated in the following table.

Candidate Corridors	Length of Corridor (Per Direction/Total Length)	Number of Travel Runs per corridor per period	Number of Periods	Total Miles of Travel Time Collection*
Before Study - Chandler Blvd	2 miles / 4 miles	5	3 (a.m., p.m., off-peak)	60 miles
Before Study - Ray Road	2 miles / 4 miles	5	3 (a.m., p.m., off-peak)	60 miles
After Study - Chandler Blvd	2 miles / 4 miles	5	3 (a.m., p.m., off-peak)	60 miles
After Study - Ray Road	2 miles / 4 miles	5	3 (a.m., p.m., off-peak)	60 miles

*Total Miles of Travel = total length of corridor x number of travel runs x number of periods

It is anticipated that the 'before' travel time data will be gathered within 2 weeks of the Notice to Proceed. The 'after' travel time data will be gathered approximately 1 month after the new signal timing plans have been implemented. City of Chandler and ADOT officials will be consulted in scheduling both data collection activities to avoid any bias due to school closure, road construction or other activities.

Task 1B: Intersection Delay Data Collection

Intersection delay data will be collected on all approaches to provide a quantitative measurement to determine the Level of Service of the intersection. To collect the intersection approach delay data, the CONSULTANT will perform an intersection delay study using vehicle-in-queue technique as outline in the 2000 Highway Capacity Manual, page 16-88. This study includes recording a count for a 10 to 20 second time interval for each cycle of the signal the number of vehicles stopped on all intersection approaches. It will be assumed that each vehicle counted in the time interval was stopped for an entire time interval.

Intersection delay data will be collected 'before' the new signal timing plans are implemented, and 'after' the new signal timing plans are implemented. It is anticipated that the 'before' intersection delay data will be gathered within 2 weeks of the notice to proceed. 'After' intersection delay data will be gathered approximately 1 week after the new signal timing plans have been implemented on the same day-of-week.

Intersection delay data will be collected during the 1-hour peak hour for each of the 3 time periods listed below. MAG will supply to the CONSULTANT the 'before' traffic and turning movement counts used to develop the 'new' signal timing plan. These counts will serve as the basis for determining the 1-hour peak period. Generally speaking, the 1-hour data collection period will occur within the following time periods.

AM Peak - 6:30 a.m. - 8:30 a.m.
P.M. Peak - 4:00 p.m. - 6:00 p.m.
Mid-Day (Saturday) - 12:00 p.m. - 2:00 p.m.

Intersections at which intersection approach delay data will be collected include:

<u>Ray Road Corridor</u>

- Ray Road at 48th Street (4 legged intersection)
- Ray Road at I-10 East Side Signals (3 legged intersection)
- Ray Road at I-10 West Side Signals (3 legged intersection)
- Ray Road at 56th Street (Priest Drive) (4 legged intersection)

<u>Chandler Blvd Corridor</u>

- Chandler Blvd at 48th Street
- Chandler Blvd at I-10 East Side Signals (3 legged intersection)
- Chandler Blvd at I-10 West Side Signals (3 legged intersection)
- Chandler Blvd at 56th Street (Priest Drive)

Task 2: Data Analysis

Task 2A: Calculate Average Travel Time
Using the GPS data collected, The CONSULTANT will calculate the average travel time through the corridor during AM peak, PM peak and Mid-Day-peak periods using the floating car technique as described above.

Task 2B: Calculate Average Travel Speed
Using the results of the GPS data collected, the CONSULTANT will measure the average travel speed through the corridor during AM peak, PM peak and Mid-Day peak periods using the floating car technique as described above.

Task 2C: Calculate Level of Service
Delay at the signalized intersection is the measure of effectiveness used to quantify Level of Service. The Level of Service will be calculated for all approaches at for up to 3 signalized intersections on each corridor (6 total), utilizing the delay data collected in Task 1. An estimate of intersection control delay will be calculated utilizing the techniques outlined on page 16-89 of the *2000 Highway Capacity Manual*. The Level of Service will be calculated for all approaches for up to 3 signalized intersections on each corridor.

Task 3: Perform Benefit-Cost Analysis
In order to effectively determine whether or not the development and implementation of new coordinated timing plans was effective, the CONSULTANT will perform a benefit-cost analysis of the signal timing improvements by comparing the 'before' and 'after' travel time and intersection delay data. The cost of the improvement will be the cost associated with the development and implementation of the new signal timing plans and will be provided by MAG and the cities. The benefits of the new plans will be computed based on a three year project life utilizing the value of one hour of travel time as currently recommended by FHWA. The differences between the 'before' and 'after' data will be highlighted. Variables to be compared for the 'before' and 'after' study include:

- Total travel time
- Running time
- Stopped time
- Average speed
- Running speed
- Number of stops
- Average vehicle delay

Deliverables and Milestones
The CONSULTANT will prepare a Draft and Final Report containing the results of the evaluation. The Draft Report will be delivered to MAG staff four weeks after the 'after' data has been collected. The Final Report will be submitted 2 weeks after the receipt of all comments from MAG on the Draft Report. 25 copies of the Final Report will be submitted to MAG staff.

Project Meetings
The Consultant will participate in three progress meetings with MAG and one MAG ITS Committee Meeting during the completion of this work assignment.

1. KICK-OFF MEETING – A kick-off meeting will be held with MAG staff prior to the first data collection effort.
2. DRAFT REPORT MEETING – A meeting will be held to discuss the Draft Signal Timing Improvement Evaluation Study, and to receive comments from MAG and City staff.
3. DRAFT and FINAL REPORT – The results of the Signal Timing Improvement Evaluation Study will be presented to the MAG ITS Committee as designated by MAG Staff.

PROJECT SCHEDULE — EV 2

It is anticipated that the ‘before’ travel time data will be gathered within 2 weeks of the notice to proceed.

The ‘after’ travel time and intersection control delay data will be gathered approximately 1 week after the new signal timing plans have been implemented. The Draft Report will be delivered to MAG Staff 4 weeks after the ’after’ data has been collected.